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XENOLITHS IN ANDESITES OF THE MASSIFS KARANČ AND ŠIATOR (SOUTHERN SLOVAKIA) AND THEIR GEOLOGICAL INTERPRETATION

(Figs. 1—11)

Abstract: In andesites of the massifs Karanč and Šiator south of Fiľakovo (Southern Slovakia) consistent and heterogenous xenoliths are abundant. The latter predominate by their quantity. Various types of crystalline schists and contact hornfelses are concerned. Xenoliths of crystalline schists are similar to the rocks of the Veporide crystalline mass. That is why we suggest the basement of the Paleogene sedimentary complex and the Neogene volcanic rocks being built in the mentioned region by a crystalline complex of Veporide type.

The xenoliths of the crystalline schists suffered only by unsubstantial contact alteration. The contact-thermic action of the magma on the xenoliths of the Oligocene sandstones was lacking unanimaly. With xenoliths which were enclosed in the magma in deeper levels, or during the penetration of the magma to the surface, intensive thermic recrystallization set in with the formation of typical contact hornfelses. However, on the contact of the magmatic body with the overlying sedimentary complexes only their hydrothermal alteration set in.

Резюме: В андезитах массивов Каранч и Шятор южнее од Филякова (южная Словакия) находятся обильно однородные и неоднородные ксенолиты. Последние по своему количеству доминируют. Речь идет о различных типах кристаллических сланцев и контактных роговиках. Ксенолиты кристаллических сланцев по своему характеру и степени динамотермальнового изменения похожи на породы вепоридного кристаллического массива. Поэтому мы предполагаем, что в данной области фундамент палеогеновых осадочных комплексов и неогенных вулканических пород образовано кристаллическим массивом вепоридного типа.

Ксенолиты кристаллических сланцев в общем были подвержены почти неззаметными контактными изменениями. Контактно-термальное влияние магмы на ксенолиты олигоценовых песчаников неоднообразно. У ксенолитов, которые были полощены в магме более глубоких уровней или во время периода проникновения магмы к поверхности, произошла интенсивная высоко-термальная перекристаллизация с возникновением типичных контактных роговиков. Но все же на контакте магматического тела с осадочными комплексами в кровлях, произошли у последных только гидротермальные изменения.

Introduction

The study of the xenoliths in eruptive rocks furnishes factual material for the solution of some basic geological problems. Namely the solution of the problem of mass composition of the underlying complexes is concerned in regions where they are penetrated or covered by eruptive rock bodies.

Recently also in the West Carpathian area substantial precision was given to the knowledge on the occurrence and character of the buried units. Some of the results were summarized in the paper of O. Fusán et alii (1969, 1971). New knowledge is based on the geological interpretation of geophysical measurements, and follow from the

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realization of deep boreholes. The study of the xenoliths in the West Carpathian neovolcanites, however, had not been carried out systematically till now.

There are references on the presence of xenoliths in various types of West Carpathian Tertiary effusives in the papers of many, mostly Hungarian authors. From these M. Scholtz (1917), J. Noszky et alii (1952), L. Ódor (1962), E. Vadász (1964) and L. Ódor (— in G. Pantó 1969) referred also to the problem of the massifs Karanč and Šiator. L. Ódor (1969) mentions from the quarry near Bobonyir xenoliths of amphibole gneisses, biotite micaschists, quartzites and pegmatites. Bibliographic references on the xenoliths problem in the neovolcanites had been evaluated comprehensively in the past in the paper of F. Fiala (1954), who investigated in detail the xenoliths in andesites south of Zvolen. We refer authors potentially interested in this problem on the cited paper. Recently the xenoliths of andesites of the Middle Slovakian neovolcanites were cited also by authors in unpublished reports (K. Karolus 1963, E. Karolusová 1968a, 1968b and o.).

In the last 10 years we directed at the study of xenoliths in the andesites of the region south of Fiľakovo (see fig. 1). We collected xenolith samples in 3 quarries: in a large

Fig. 1. General geological map of the wider environment of xenolith occurrence (according to the geological map of Czechoslovakia 1 : 200 000). 1 — Tertiary volcanites as a whole, 2 — sediments of Neogene basins, 3 — Mesozoic as a whole, 4 — Paleozoic as a whole, 5 — Veporide crystalline complex, 6 — Margecany-Ľubeník fault, 7 — the boundary between the West Carpathians and the Pannonian block, 8 — the frontier between Czechoslovakia and Hungary, 9 — locality of the xenolith study.

several horizon quarry in the vicinity of the village Šiatorošská Bukovinka, approx. 500 m NNW of the railway stop Šiator; in the quarry cca 250 m east of the road Šiatorošská Bukovinka — state frontier, and finally in a small quarry on the territory of Hungary 2 km NE of the village Karancsalja near the community Boboynir.

For miscroscopical study we have taken 100 xenolith specimens; the substantial part of them derives of the large quarry near the railway stop Šiator. This quarry represents at the same time a locality with the most abundant xenolith occurrence. In the whole, however, the percentual representation of various rock types in the xenoliths and their character is identic in each of the three quarries.

The andesites with xenolites build up a 600—700 m high, 3 km long and 1—1,5 km wide ridge Komorú Tetö—Šiator (elev. point 725), the domal massif Šiator (elev. point 659,6). According to I. Noszky (1952) the massifs Karanč and Šiator are laccoliths which dome-like uplifted the surrounding Miocene and Oligocene sediments. The subvolcanic character of the massifs was supported also by other authors (K. Karolus et alii 1958, M. Kuthan 1963, E. Karolusová 1968a). The mentioned massifs were assigned to the Low Tortonian subvolcanic bodies. On the other hand, E. Karolusová (1968a) ranged the intrusions of the andesite massifs to the Middle up to the Upper Tortonian, i. e. to the era after the so called Late Styrian folding phase.

The rocks of the Karanč and Šiator massifs belong to two basic petrographical types: 1. garnet-hornblende andesite, 2. hypersthene-hornblende andesite with a small amount of biotite. Based on the matrix textures several other varieties can be distinguished among the mentioned types.

The characteristics of the xenoliths

The xenoliths appear in the investigated quarries in garnet-hornblende andesites. E. Karolusová (1968b) dealed during the last years with the petrographical and chemical study of andesites of the said massifs and performed at the same time also the study of the chemical composition of andesite minerals, as well as the study of the matrix composition.

The andesites of the massif Karanč (incl. the andesites in the studied quarries) are conspicuously porphyric rock types of heterogenous colouring varying from lightgrey, to greenishblack. The diverse colour of the andesite is due to the texture type, the representation of the porphyric phenocrysts and the groundmass the degree of secondary alteration and o.

Porphyric phenocrysts are made up by garnet (up to 10 mm), hornblende (up to 8 mm) and by plagioclase (up to 10 mm). On the cracks zeolites, chlorites, carbonates and quartz occur in the andesites. The texture of the andesite is holocrystalline, in places cryptocrystalline, sporadically also pilotaxitic. It is made up of chlorite, plagioclase, magnetite, calcite, scarcely even by minute biotite aggregates.

Garnet is the characteristic mineral of this type of andesites. Recently it has been the subject of study of B. Zorkovský (1950) and E. Karolusová (1968b). As the contact near zones of the massif does not show increased garnet concentrations the author suggests, that its genesis is conditioned by the assimilation of Al-rich material in the period before the intrusion of the bodies into their present-day position. On the basis of the relations in the quarry near Bobonyir, L. Ódor (1962) assumes garnet formation being a direct consequence of the assimilation of xenoliths of the country rocks.

1. Contact hornfelses

Various hornfels types make up irregular xenoliths mostly of several cm size. These rocks are prevailingly very fine-grained, up to aphanitic, unequally coloured. The are of massive, only in sporadic cases of unconspicuous oriented texture. Compared with the amount of crystalline schist inclusions the quantity of hornfels xenoliths is small. We differentiate the following hornfels types:

1.1. Biotite—andalusite—sillimanite hornfels (fig. 2). A massive and uncouspicuously oriented rock is concerned. The hornfels of this type is of dark-grey colour with a marked violet hue. Xenoliths of this type show in detail unhomogenous colouring, the contact planes with andesite are sharp and straight. On the fracture planes the presence of calcite, zeolites, chlorite and quartz chambers and aggregates can be observed locally. The texture of sillimanite hornfelse is nematofibroblastic, granonematoblastic. The substantially represented minerals of this type are: biotite, andalusite, sillimanite. The shape and size of the sericite and sericite-chlorite pseudomorphoses in some thin sections indicate a possible presence of cordierite in this rock type. Pleonast and corundum are typical accessories, in addition minerals of the epidote-clinozoizite group, plagioclase, magnetite, titanite, chlorite, quartz: calcite and zeolites form most often aggregates, resp. irregular chambers. They are the products of hydrothermal activity during cooling down of the magma. On the hair cracks of hornfelses the presence of sulfides can be observed locally.

1.2. Pyroxene hornfels (fig. 3) is a massive, deep-green rock type of aphanitic character. This hornfels is made up only of a fine-grained aggregate of pyroxene individuals. They show isomorphic or short-columnar character. The rock has typical cherty pavement texture. Pyroxene is light-green, slightly pleochroic. It is a member of the diopside-hedenbergite series with prevalence of the diopside molecule. The interspaces between the pyroxenes are filled by a fine-grained plagioclase aggregate. Sporadically also secondary calcite is present (mostly in the form of grain aggregates), in places even tabular zeolites are dimensionally allied with it. Scarcely minute ore mineral grains are present in the rock.

Based on the mass composition it can be assumed, that the original rock of the pyroxene hornfelses has been a sediment of marly character. Such types of sediments are a frequent rock constituent of the Oligocene complex of this region.

1.3. Quartz-pyroxene hornfels (fig. 4, 5). The transitions between the types 1.2 and 1.3 are gradual. They are conditioned by the increase of oval quartz grains of 0.3—0.5 mm, predominating by their size over the fine-grained pyroxene aggregate, building the hornfels matrix. On the basis of the character, the optic orientation and the location of the quartz grains we assume that they represent clastic fragments of the original sediment. It had the character of a sandstone with marly cement. The original rock belonged also to the Oligocene complex.

Besides strongly predominating pyroxene and quartz, also plagioclases, accumulation of chlorite, calcite and leucoxenized ore minerals were found in this type of hornfels.

Owing to resorbtion of sandstone shreds by the andesite magma only cement recrystallization set in in sandstones. The thermic action of the magma was not able to induce the recrystallization of the whole mass of the original sandstone.

In some xenoliths of the quartz-pyroxene hornfelses even macroscopically milky-white quartzes are striking, making up, "amygdaloidal" forms. It is a quartz of a younger generation, the origin of which is allied with the hydrothermal activity of the cooling

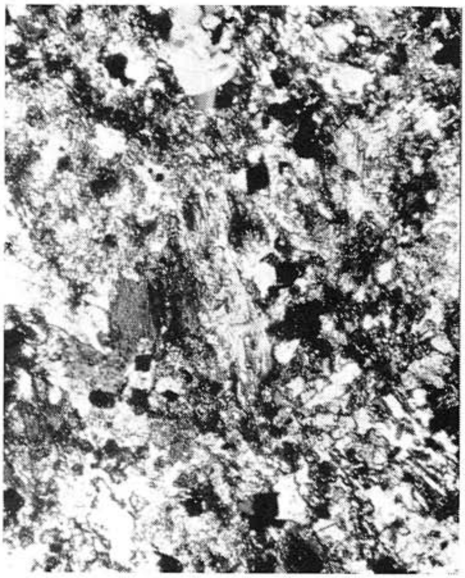

Fig. 2. Biotite-andalusite-sillimanite hornfels (type I.1). Magn. 65 ×, X nicols. Photo L. O s v a l d.

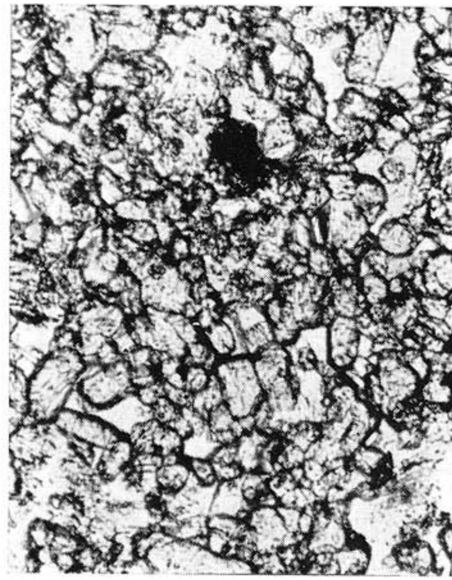

Fig. 3. Pyroxene hornfels. The interspaces between the pyroxenes are filled up with plagioclase. Magn. 204 ×, X nicols. Photo L. O s v a l d.

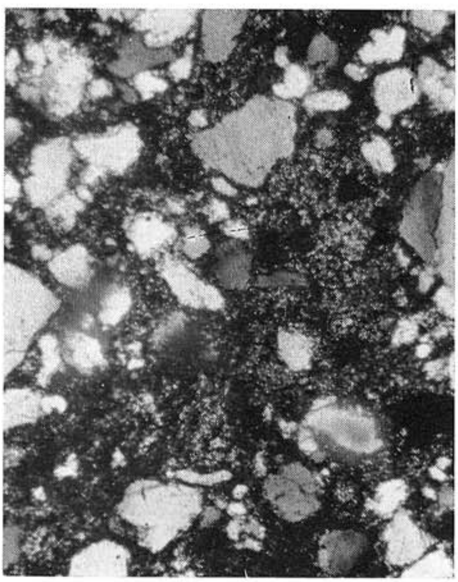

Fig. 4. Quartz-pyroxene hornfels. Quartz is represented by clastic grains, pyroxene makes up the fine-grained matrix, which originated by recrystallization of the original marly cement of the sandstone. Magn. 37,5 ×, X nicols. Photo L. O s v a l d.

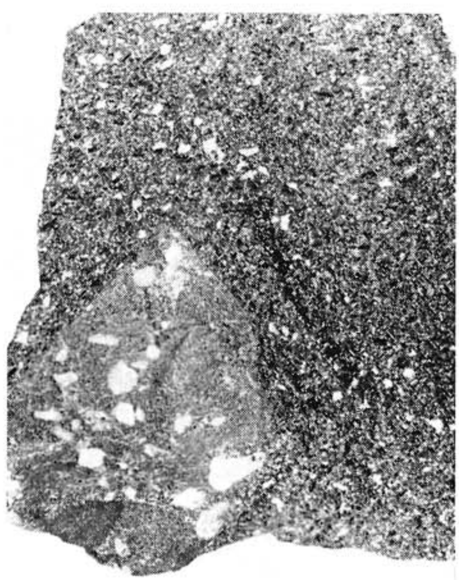

Fig. 5. Quartz-pyroxene hornfels. Milky "amygdales" in the hornfels are made up of II. generation quartz. $^{1}/_{4}$ of the natural size. Photo L. O s v a l d.

magma. Also the recrystallization of pyroxene grains on the borders of the amygdaloidal quartz formations might prove for the epigenetic genesis of quartz II.

1.4 Plagioclase — hornblende (?) — pyroxene hornfels. This rock type differs from the pyroxene hornfelses by its grey colour. The microscopical image of this hornfels type is as follows: in a fine-grained plagioclase-pyroxene matrix with pavement texture in places idiomorphic porphyroblasts of light-green pyroxene of the diopside-hedenbergite series occur. In this mass dirty-brown accumulations made up of a fine-grained aggregate appear locally. With largest magnification of microscope sporadically minute individualized grains can be observed, with cleavage 110, brownish pleochroism and extinction γ/c up to 26°. Probably brown hornblende might be concerned. Also in this hornfels type appear aggregates of fineflaky chlorite, quartz, or calcite — zeolite vesicle filling.

Sediments of argillaceous-marly character were the original material of this hornfels type.

2. Hydrothermally altered sandstones (fig. 6)

The weak thermic-recrystallization effect of the andesites of the Karanč and Šiator massifs on the roof sediments is known (L. Ódor 1962, E. Karolusová 1968b a o.). The action of the andesite magma displayed only in hydrothermal transformation of the sandstone cement. Its intensive carbonatization, locally limonitization set in. On some samples the formation of an aggregate-polarizing submicroscopis mass (sericite?) can be observed. Hydrothermal alteration revealed by the total consolidation of the sandstones. Dependent on the cement quantity and character the final product of the hydrothermal alteration of sandstones is in part of different character. Even after hydrothermal transformation the sedimentary character of these rocks is evident.

3. Crystalline schists

This type of xenoliths is prevailing in the investigated area. They form most frequently flat fragments of 10 × 20 cm reaching sporadically up to 50 cm size. In the majority of the crystalline schists xenoliths their unhomogenous character can be recognized even macroscopically. The representation of various rock types in the scope of a single xenolith is rather variable.

3.1 Gneisses

Gneisses show in xenoliths an unconspicuously oriented and dimensionally parallel structure. Banded structure with alteration of lighter and darker stripes is frequent. They are in the rule fine-grained. The thickness of the diverse-coloured stripes is rather variable.

3.1.1 Micaless gneisses (plagioclase > K-feldspars) (fig. 7, 8, 9, 10). These rocks are lightgrey in places up to dirtywhite. They are marked by schistosity, the absence of micas due to the bedded texture of quartz and feldspars, as well as to the elongated shape of these minerals. The texture is granoblastic. The micaless gneisses are built by quartz, plagioclases (18—24 % An) partly of albite interogrowth and by unconspicuously porphyroblastic K-feldspars. In accessory amounts also biotite (flake accumulations), chlorite, zircon is present, the content of which is high for the gneisses; apatite, garnet, magnetite, titanite, minerals of the epidote-clinozoisite group and calcite.

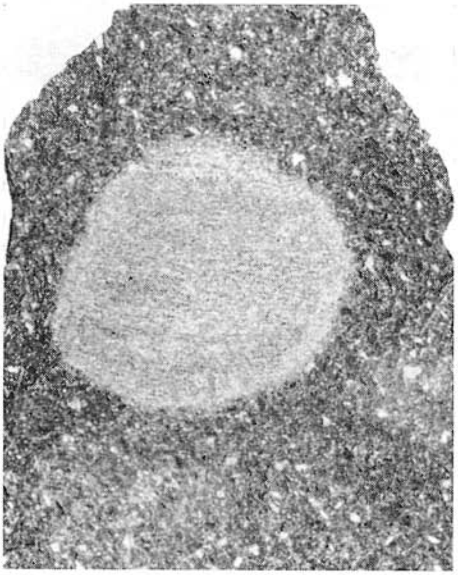

Fig. 6. Xenolith of a hydrothermally altered Oligocene sandstone. $^{1}/_{4}$ of the natural size. Photo L. O s v a l d.

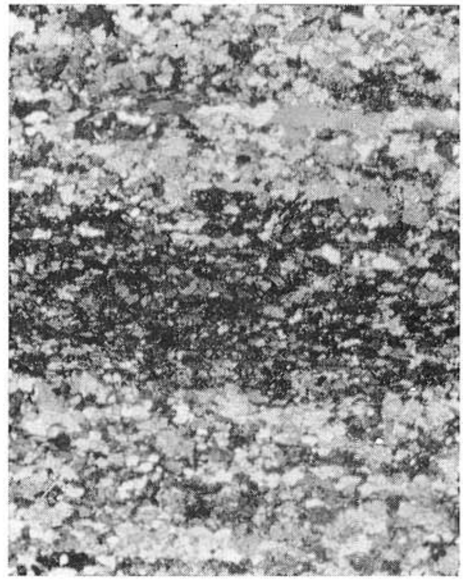

Fig. 7. Banded micaless gneiss (light beds) and hornblende-biotite gneiss (dark beds). Magn. 67,5 ×, X nicols. Photo L. O s v a l d.

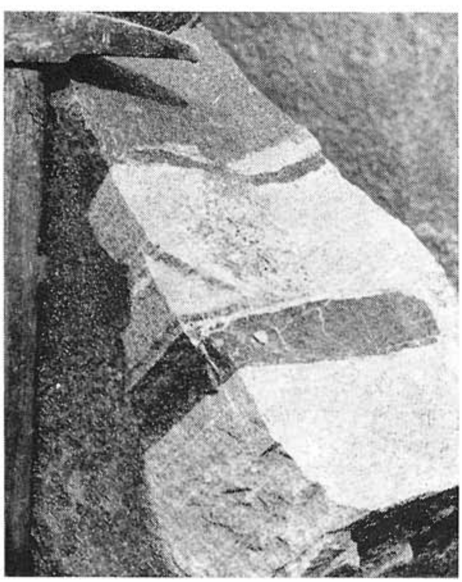

Fig. 8. A heterogenous xenolith made up of hornblende gneiss (dark belt) and of an unconspicuously banded micaless gneiss (light part of the xenolith). Photo D. H o v o r k a.

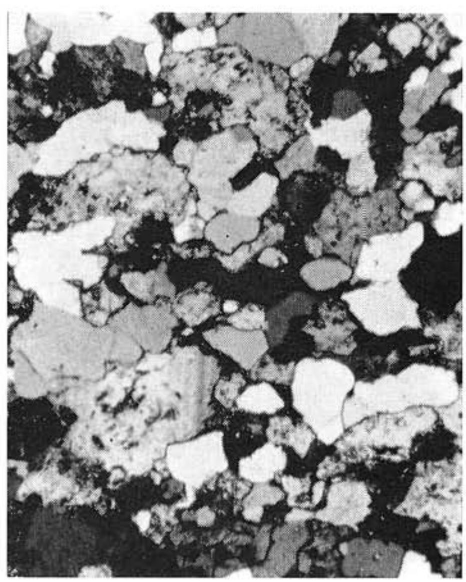

Fig. 9. Granoblastic texture of the micaless gneiss. Magn. 45 ×, nicols X. Photo L. O s v a l d.

The central part of a large xenolith of a micaless gneiss from quarry near the railway stop Šiator has been analysed (table 1, analyst: P o l a k o v i č o v á).

T a b l e 1. Chemical analysis of the micaless gneiss

SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	H_2O^-	H_2O^+	Σ
74,16	0,23	14,31	0,28	0,28	0,03	0,10	2,54	4,91	3,37	0,01	0,41	0,01	100,64 %

The contact of the micaless gneiss with andesite is sharp. Under the microscope a narrow belt (up to 5 mm in the rule) and intensive carbonatization and chloritization can be observed under the simultaneous formation of secondary quartz.

3.1.2 B i o t i t e g n e i s s e s (plagioclase > K-feldspars). They differ macroscopically from the type 3.1.1 by darker coulouring and by macroscopically recognizable presence of biotite. For xenoliths of the investigated quarries the alteration of micaless gneiss beds with biotite gneisses is charakteristic, the thickness of the biotite gneisses being in the rule up to 1 cm, sporadically up to 5 cm.

The mass composition of biotite gneisses is simple: plagioclase, quartz, K-feldspars, biotite (in places intensivelly chloritized). In accessory amount were found: titanite, zirkon, apatite, magnetite, hornblende, minerals of the epidote-clinozoizite group.

In the contact zone with the andesite one can recognize an intensive secondary transformation of light and dark minerals of the rock. In the whole the character of the contact zone corresponds to the type 3.1.1.

3.1.3 B i o t i t e - h o r n b l e n d e a n d h o r n b l e n d e - b i o t i t e g n e i s s e s (plagioclase > K-feldspars) (fig. 11). They form greyish-green coloured beds alternating

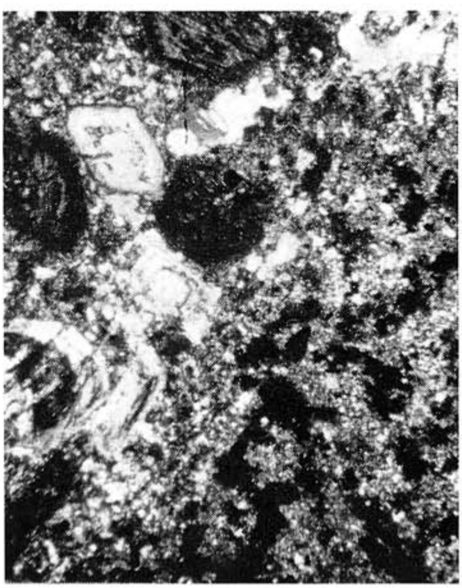

Fig. 10. Intensively hydrothermally altered contact zone between andesite and gneiss. Magn. 30 ×, X nicols. Photo L. O s v a l d.

Fig. 11. A heterogenous xenolith bult by amphibolite (dark stripe), hornblende-biotite gneiss (grey stripe) and ophtalmitic migmatite (the light tract of the xenolith). 1/4 of the natural size. Photo L. O s v a l d.

with biotite gneisses, sporadically also with micaless gneisses. They are conspicuously schistose fine-grained types of granoblastic texture. Composition: plagioclase (20—30 % An), green common hornblende, biotite, quartz, in places also K-feldspars. Titanite, apatite, zirkon, magnetite, leukoxene are present in accessory amounts. The mineral of the epidote-clinozoizite group, leukoxene, calcite, chlorite, Fe-hydroxides, clay minerals are the products of transformation in the hydrothermal stage.

3.2 Metabasites

They differ from the preceding xenoliths types by darker colouring, due to a substantial representation of green common hornblende. They make up separate xenoliths or are present in xenoliths together with various types of gneisses.

3.2.1 Amphibolites. In the xenoliths we found all transitional rock types in the series biotite-hornblende gneiss-hornblende gneiss-amphibolite. The transitions are due to the variable representation of quartz on one side and to the green common hornblende and plagioclase on the other.

Amphibolites are deep-green schistose, fine-grained rock types. By increased biotite content they pass over to the type 3.2.2. Their composition is not complicated: green common hornblende, plagioclase. In accessory amount titanite, apatite, quartz, biotite, minerals of the epidote group, titanomagnetite are present. The content of secondary minerals (calcite, Fe-hydroxides, chlorite, products of hydrothermal plagioclase decay) is variable. The contact hydrothermally intensively altered zone between the amphibolite and andesite is very narrow.

The central part of a large amphibolite xenolith from the quarry near the stop Šiator has been analyzed (tab. 2, analyst: Polakovičová).

Table 2. Chemical analysis of the amphibolite

SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	H_2O^-	H_2O^+	Σ
48,77	1,56	13,66	4,07	7,0	tr.	7,41	7,88	3,23	2,03	0,20	1,27	2,52	99,64 %

3.3.2 Biotite amphibolites. They differ from the amphibolites by the substantial presence of biotite replacing diffusion—metasomatically hornblende. It forms often diagonal oriented flakes. In hydrothermally altered varieties the formation of abundant titanite on the rim of biotite flakes can be observed. The representation of minerals and their relations are similar as in the type 3.2.1.

3.3 Migmatites

In the individual parts of the quarry near the railway stop Šiator the representation of migmatite xenoliths is variable. Only one textural type of migmatites has been found dealt with further on.

3.3.1 Ophtalmitic migmatite. The rocks are light, conspicuously oriented of ophtalmitic up to ophtalmitic-banded texture. The rock eyes are made up of white feldspars of up to 2 cm length; the feldspar eyes are in the rule smaller. The rock as a whole is very light, dirtygrey. The rock texture is conspicuously porphyroblastic. Porphyroblasts are made up of plagioclasses and K-feldspars. Biotite or chlorite accumulation into bands or lense-shaped aggregates is characteristic for the rock on the thin section. Postcrystalline pressure deformations do not intensively reweal on the rock.

The composition of the ophtalmitic migmatites is as follows: plagioclase, K-feldspars, quartz, biotite, chlorite, titanite, zirkon, apatite, magnetite, calcite, leukoxene, minerals of the epidote-clinozoizite group.

From the given survey of the recorded types of crystalline schists follows that the premetamorphic character of the parent rocks was heterogenous. Essentially sediments of the argillaceous sandy group were concerned; this type passing in vertical and lateral direction into sediments with admixute of pyroclastic material of basic volcanites.

The modal composition of some xenolith types is as follows (tab. 3):

T a b l e 3. The modal composition of some xenolith types

	1	2	3	4	5	6	7	8	9
plagioclase	68,8	62,6	40,6	42,5	31,0	42,9	43,5	40,5	41,1
K-feldspars	8,8	10,8	22,3	10,0	14,0	—	—	—	15,7
quartz	21,2	25,6	36,3	28,8	25,6	10,9	8,8	1,9	39,4
amphibole	—	—	—	—	14,9	33,3	31,9	43,6	—
biotite	—	0,5	—	4,9	3,6	2,2	2,3	0,9	0,3
chlorite	0,7	0,5	0,3	9,5	8,6	7,8	6,9	6,6	2,1
accessories	0,5	—	0,5	3,9	2,0	2,7	6,5	6,6	1,4

1—3 — micaless gneisses, 4 — biotite gneiss, 5 — biotite-hornblende gneiss, 6 — hornblende gneiss, 7 — amphibolite with quartz, 8 — amphibolite, 9 — ophtalmitic migmatite.

The geological interpretation of the results of xenolith study

The knowledge on the deep geological structure of the Central West Carpathians extended substantially during the last years (O. F u s á n et alii 1969, 1971 a o.). V. D a n k, J. F ü l ö p et alii (1967) published the geological map of the Paleozoic and Mesozois basement of the young formations of Hungary. Data on the geological structure or the rock filling of the basement of adjacent regions at Hungary may be found also in the papers of E. V a d á s z (1964) and L. T r u n k ó (1969).

The present knowledge on the geological structure of the basement of Tertiary sediments and volcanites in the region south of Fiľakovo can be characterized as follows:

Based on the geological interpretation of geophysical measurements and the results of deep boring in the sense of O. F u s á n et alii (1971, p. 137) "west of the Rimava depression the basement probably consists mostly of the Gemeride Late Paleozoic. The Mesozoic formations are presumed to occur only in the west near the Rimava valley".

Prior to further discussions it should be said that in the northern part of the Lučenec basin in the vicinity of the outcropping of the Veporide crystalline complex the Permian and the Gelnica group of the Gemerides has been found in borings (I. V a r g a 1969 — in O. F u s á n et alii 1971). There are, however, only few concrete supporting data for the solution of the basement character of the Lučenec basin southern part, i. e. of the region of xenoliths occurrence. The older formations are not outcropping and borings did not reach the basement in this region. Therefore the relief and character of the basement could be presumed by now based on geophysical measurements only (map of Bouguer anomalies, scale 1 : 200 000, in O. F u s á n et alii 1971).

Discussing the character of the crystalline basement of the neovolcanites of the southern environment of Fiľakovo the question emerges of the relevance to some of the West Carpathian crystalline complexes. South of the Margecany-Ľubeník fault, along which the Gemerides are thrust on the southern margin of the Veporides, the Veporide crystalline complex is not dropping out more. Thus the crystalline complex in the volcanite basement south of Fiľakovo might belong either to the Veporide crystalline mass or to the Pannonian block (Tissia). Based on the papers of O. F u s á n et alii (1969, 1971), but also on former synthetizing papers of E. V a d á s z (1964) and L. T r u n k ó (1969) the boundary between the Carpathians and the Pannonian block is lead more southward. According to O. F u s á n et alii (1971) it displyas in the surface by eruptions of Tertiary volcanites (Czerhát Mts., Mátra Mts.). In the sense of these facts we do interprete the investigated xenoliths explicitely as rocks of south buried zones of the West Carpathian crystalline mass (Slovak block).

On the basis of the great content of xenoliths of crystalline rocks in andesites of the massif Karanč E. V a d á s z (1964) stated that there is a crystalline mass in the basement. He demonstrated his idea on a tectonic map (Annex of the cited paper), where he marked on territory adjacent to Hungary "an old Caledonian-Variscian crystalline basement". He determined its southern margin towards the buried Permian-Mesozoic complexes in the Tertiary basement from the region we have been studying over Salgotarján WSW towards Štúrovo. The author, however, did not mention the petrographic character of the xenoliths.

According to the above cited author (1964, p. 385) the crystalline massif was cropping out in the form of a horst, from the northern borders of the Mátra massif towards the frontier of Czechoslovakia up to the Helvetian. This crystalline massif touches the Vepor crystalline complex. This peneplenized massif in the era of Miocene folding had the role of a consistent rigid body. L. T r u n k ó (1969) stated on the map of Pre-Tertiary basement a crystalline mass being the basement of younger formations, similarly as E. V a d á s z (1964) on the Hungarian territory on the belt north of Šalgotarján SW towards Štúrovo. This author (l. c.) however, did not interprete the basement in the region of the massifs Karanč and Šiator as a crystalline mass.

The region of the xenolith study lies in the SW continuation of the Gemeride Paleozoic units. The nearest occurrence of the Veporide crystalline mass are approximately 30 km northward from the massifs Karanč and Šiator. By establishing crystalline schist xenoliths belonging by the degree of dynamothermal metamorphism to rocks of the almadine amphibolite up to amphibolite facies, the possibility of Gemeride Paleozoic formations occurring in the basement of the investigated area is excluded. Paleozoic rocks of Gemeride type or Mesozoic rocks have not been found in the form of xenoliths in the mentioned quarries. It is thus most probable that in the basement of volcanites and Tertiary sediments the crystalline complex appears directly, corresponding by its lithological character and the grade of dynamothermal metamorphism to Veporide crystalline complex.

Based on the study of the xenoliths in the quarries of the Karanč and Šiator massifs and on the confrontation of views on the basement structure of the given region, we present the following idea of the geology of the basement in this region:

The basement of the Tertiary sedimentary complexes and of the volcanic rocks of the given area is buil by a crystalline complex of Veporide type. Thus it follows, that the Veporide crystalline complex appear near to the surface also in the southern part of the Lučenec basin, i. e. south of the Margecany-Ľubeník fault.

The crystalline block appearing in the basement of younger formations north from the mountain chain Mátra represents the southern wing of the Veporide crystalline complex. According to our idea the Paleozoic Gemeride complexes originated in a geosyncline founded on this autochtonous complex. The axis of the Paleozoic geosyncline was emerging transversally towards SW. At the same time the segmentation of this crystalline block might be locally suggested, the individual segments having gained various levels owing to Pre-Alpine and Alpine tectonic processes. In the studied area one of the crystalline massifs segments is emplaced shallow (500—1000 m?) beneath the sediments and Tertiary volcanite.

Conclusion

The xenoliths in andesites of the massifs Karanč and Šiator on the Czechoslovak-Hungarian frontier are of variable character. During the given phase of research we performed the study of the heterogenous xenoliths. We distinguished: 1. diverse types of contact hornfelses, 2. hydrothermally altered Oligocene sandstones, 3. different types of crystalline schists. The latter rock types are the most abundant ones. The thermic effect of the andesite magma displayed mainly on xenoliths of Oligocene sediments absorbed by the magma in the period of its penetration to the top. The thermic activity of the magma did not substantially reveal on the crystalline schist xenoliths.

In the course of several years xenolith collection in the quarries of these massifs neither xenoliths of Paleozoic rocks of Gemerides, nor xenoliths of Mesozoic rocks were found.

Oligocene sediments of the southern part of the Lučenec basin were the parent material of the contact hornfelses. During thermic recrystallization especially transformation of the cement and matrix of these rocks has been inluced. In the case of argillaceous character of the original material, hornfelses with the association of Al minerals, in the case of a marly cement rocks with high pyroxene content originated. Part of the sandstones preserved the original texture and the clastic quartz grains. Hydrothermal solutions representing after-effects of volcanic activity brought about locally in the hornfelses the formation of the assemblage calcite-chlorite-epidote-zeolites-quartz.

The original pre-metamorphic character of the crystalline schists was rather heterogenous. In the whole it was the alternation of argillaceous-sandy sediments with layers with admixture of pyroclastic material of basic volcanites. By the increase of pyroclastic material their metamorphic equivalents gently pass from micaless gneisses over hornblende gneisses into amphibolites. Thus often only a thickness of some millimeters of these latter eliminate the possibility of their origin from lava flows, or deep seated bodies.

According to ideas expressed so far in tectonic syntheses (J. Kamenický, in M. Mahel, T. Buday et alii 1968, O. Fusán et alii 1971) the Gemerides continue in the basement of younger formations southwestward towards Lučenec and border SE and S margin of the Veporides. The investigated xenoliths of the crystalline complex indicate, that the deep structure of this region is more complicated and 30 km SE from the boundary of the Veporide Kohút zone and the Gemerides a deep-metamorphosed crystalline mass of the Veporide type appears in the basement. So far it cannot be presumed from the study of one region whether isolated islands of a higher-metamorphosed crystalline complex are concerned, or the Gemerides are gradually wedging out towards SW.

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REFERENCES

DANK, V., FÜLÖP, J., 1967: Geological map of the Paleozoic and Mesozoic Basement of Hungary. Budapest.

FIALA, F., 1954: Některé uzavřeniny z andezitů Slovenského Středohoří. Sbor. Ústř. úst. geol., Odd. geol. (Praha), 21, p. 309—339.

FUSÁN, O., KUTHAN, M., ĎURATNÝ, S., PLANČÁR, J., ZBOŘIL, L., 1969: Der geologische Untergrundbau der mittelslowakischen Jungvulkanite. Zborn. geol. vied, Západné Karpaty (Bratislava), 10, p. 108—160.

FUSÁN, O., IBRMAJER, J., PLANČÁR, J., SLÁVIK, J., SMÍŠEK, M., 1971: Geological structure of the basement of the covered parts of southern part of inner West Carpathians. Zborn. geol. vied, Západné Karpaty (Bratislava), 15, p. 115—173.

KAROLUS, K., 1963: Zur Petrographie und Petrochemie der jungen Eruptiv Gesteine der Slowakei. Assoc. geol. Carp.-Balcan Congr. (Bucuresti), p. 87—91.

KAROLUSOVÁ, E., 1958: Príspevok ku problematike pyroklastík. Geol. práce (Bratislava), 49, p. 78—104.

KAROLUSOVÁ, E., 1968 a: Petrografia a petrochémia niektorých andezitov. Manuscript, Archiv Geol. ústavu D. Štúra, Bratislava.

KAROLUSOVÁ, E., 1968 b: Záverečná zpráva o doterajších výskumoch bazálnych pyroklastík. Manuscript, Archiv Geol. ústavu D. Štúra, Bratislava.

KUTHAN, M. et alii, 1963: Vysvetlivky ku generálnej geologickej mpae ČSSR 1 : 200 000. List Zvolen. Geofond (Bratislava), p. 7—132.

MAHEĽ, M., BUDAY, T. et alii, 1968: Regional geology of Czechoslovakia. Part II. The West Carpathians. Praha, p. 5—723.

NOSZKY, J., HERRMANN, M., VARGA, S., 1952: Volcanologie, géologie et pétrochimie des andésites de la partie l'est du comitat Nográd. Földt. Közl. (Budapest) 82, p. 8—35.

ÓDOR, L., 1962: Conditions lithologiques et géologiques de la montagne Karancs. Földt. Közl. (Budapest), 92, p. 385—399.

ÓDOR, L., 1969: Karancsalja-Bobonyir quarry. In G. Pantó: Geology of Northern Hungary. Budapest, p. 38—39.

SCHULTZ, M., 1917: Die Andesite des Karancs-Gebirge. Földt. Közl. (Budapest), 47, p. 321—335.

TRUNKÓ, L., 1969: Geologie von Ungarn. Stuttgart, p. 1—257.

VADÁSZ, E., 1964: Geologija Vengrii. Moskva, p. 5—532.

ZORKOVSKÝ, B., 1950: Chemická povaha granátov z granátického andezitu od Tisovca a Šiatoroša. Geol. sborn. Slov. akad. vied (Bratislava) 1, No. 2—4, p. 225—229.

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